"Performance Evaluation of UGV Obstacle Detection
with LADAR and CCD/FLIR Stereo Vision",
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The next phase of unmanned ground vehicle (UGV) development sponsored by OSD (the Experimental Unmanned Vehicle, or "Demo III" Program) aims to enable round-the-clock operation with autonomous, cross-country navigation at speeds up to 20 mph by day and 10 mph by night. This paper reviews the obstacle detection lookahead distances required to support such driving speeds, then presents results of obstacle detection performance evaluation with three different range imaging systems: (1) the Dornier EBK ladar, (2) stereo vision with CCD cameras, and (3) stereo vision with InSb FLIR cameras operating in the 3-5 um band. The ladar and the FLIR stereo are applicable to day and night operation; the CCD stereo to day operation only. An extensive data set for this performance evaluation will be collected at Aberdeen Proving Ground in November, 1997. This data set will include rocks and trenches of various sizes, imaged at several distances from the UGV, image sequences obtained while driving over standard obstacles at a variety of speeds, and images of overhanging branches and a variety of vegetation. This paper will describe the data set and the performance evaluation results obtained. Results of this performance evaluation will provide a benchmark to guide mobility sensor selection for the balance of the Demo III Program.